

**REMARKS**

On entry of this Response, claim 24 is amended to recite a system including an etchant as an element. Support for the amendment can be found, for example, in the original claims. No new matter is added.

Claims 1-23 were withdrawn in response to the Examiner's restriction requirement. Amongst remaining claims 24-31, claim 24 is independent. Applicants respectfully submit that claims 24-31 define over the prior art of record.

**I. Claim Rejection under 35 U.S.C. §112, First Paragraph**

Claims 24-31 stand rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. The Examiner asserts that the claimed range  $0 < z < 1$  is not supported by the specification. See Office Action, page 2. Applicants respectfully traverse this rejection in view of the following reasons.

The Specification of the instant application describes that the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material may have the ranges of  $0 < x < 1$ ,  $0 < y < 1$ ,  $0 \leq z < 1$  and  $0 < x + z < 1$ . See Specification, page 8. The claimed range  $0 < z < 1$  is included within the range described in the Specification. Therefore, Applicants respectfully submit that the claimed range  $0 < z < 1$  is supported by the Specification of the instant application.

For at least the reasons set forth above, Applicants respectfully submit that the claims contain subject matter which is described in the specification in such a way as to reasonably convey to one of ordinary skill in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. Therefore, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 24-31 under 35 U.S.C. §112, first paragraph.

**II. Claim Rejection under 35 U.S.C. §102(b)**

Claims 24 and 26-31 stand rejected under 35 U.S.C. §102(b) as being anticipated by Mishurnyi *et al.* (“Multicomponent Sb-based solid solutions grown from Sb-rich liquid phases”). See Office Action, page 3. Applicants respectfully traverse this rejection in view of the amended claims.

Applicants respectfully submit that Mishurnyi *et al.* does not disclose “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in amended claim 24.

Mishurnyi *et al.* describes multi-component Sb-based solid solutions, such as InGaAsSb, AlGaAsSb and AlGaInAsSb, grown from Sb-rich liquid phases. Mishurnyi *et al.*, however, does not disclose a wet acid etchant including organic acid, oxidizing agent and hydrofluoric acid for wet acid etching of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material. There is no disclosure in Mishurnyi *et al.* of an etchant for etching the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material.

For the reasons set forth above, Applicants respectfully submit that Mishurnyi *et al.* does not disclose each and every element of amended claim 24. Claims 26-31 depend from claim 24 and, as such, incorporate all of the features recited in claim 24. Therefore, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 24 and 26-31 under 35 U.S.C. §102(b).

**III. Rejection of Claims 24 and 26-31 under 35 U.S.C. §103(a)**

Claims 24 and 26-31 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mishurnyi *et al.* in view of US 5,798,540 to Boos *et al.* (hereinafter “Boos *et al.*”). See the Office Action, page 4. Applicants respectfully traverse this rejection in view of the amended claims.

Applicants respectfully submit that Mishurnyi *et al.* and Boos *et al.*, alone or in any reasonable combination, do not teach or suggest “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in amended claim 24.

Mishurnyi *et al.* does not teach or suggest the above feature.

Boos *et al.* describes an electronic device characterized by a GaAs substrate and a base disposed on the substrate. In Boos *et al.*, “[t]he gate air bridge fabrication is accomplished by a liquid etchant containing more than half, on volume basis, of concentrated lactic acid or acetic acid with remainder hydrogen peroxide and concentrated hydrofluoric acid,” and “[t]he etchant attacks InAs,  $\text{In}_x\text{Al}_{1-x}\text{As}_y\text{Sb}_{1-y}$ , AlSb, and GaSb but does not attack GaAs and Au-based alloys.” See Boos *et al.*, abstract.

Boos *et al.*, however, does not teach or suggest “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in amended claim 24. The etchant described in Boos *et al.* only “attacks InAs,  $\text{In}_x\text{Al}_{1-x}\text{As}_y\text{Sb}_{1-y}$ , AlSb, and GaSb.” Boos *et al.* does not teach or suggest that the etchant etches a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, as required by the claimed invention. Although Boos *et al.* is combined with Mishurnyi *et al.*, the combination does not teach or suggest the above feature. The cited references are silent about an etchant for etching the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material.

In the Office Action, the Examiner asserts that “[a]lthough Boos may not specifically teach that the etchant is used on AlGaInAsSb structures, a routineer in the art would have appreciated the work since Boos teaches etching AlInAsSb, and would have applied this known etching composition to Mishurnyi in order to obtain a desired structure.” See Office Action, page 4. Applicants respectfully disagree.

Applicants respectfully submit that the AlGaInAsSb material is different than AlInAsSb described in Boos *et al.* Boos *et al.* describes that “[t]he etchant ... does not attack GaAs and Au-based alloys.” *See* Boos *et al.*, abstract. Applicants respectfully submit that there is no prior art showing that the etchant described in Boos *et al.* is applied to the AlGaInAsSb material.

The claimed invention uses the etchant, which includes organic acid, oxidizing agent and hydrofluoric acid, to produce a semiconductor structure including GaSb-based material. With this feature, the claimed invention provides a convenient and cost-efficient process for etching the AlGaInAsSb material. *See* the Specification, page 5. There is no motivation in the prior art to apply the etchant described in Boos *et al.* to the AlGaInAsSb material. Therefore, Applicants respectfully request that the Examiner provide documentary evidence supporting the Examiner’s position.

For the reasons set forth above, Applicants respectfully submit that Mishurnyi *et al.* and Boos *et al.*, alone or in any reasonable combination, do not teach or suggest each and every element of amended claim 24. Claims 26-31 depend from claim 24 and, as such, incorporate all of the features recited in claim 24. Therefore, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 24 and 26-31 under 35 U.S.C. §103(a).

#### **IV. Rejection of Claim 25 under 35 U.S.C. §103(a)**

Claim 25 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Mishurnyi *et al.* or Mishurnyi *et al.* in view of Boos *et al.*, and further in view of Garbuzov *et al.* (“2.3-2.7- $\mu$ m Room Temperature CW Operation of InGaAsSb-AlGaAsSb Broad Waveguide SCH-QW Diode Lasers”). *See* Office Action, page 5. Applicants respectfully traverse this rejection in view of the amended claims.

Claim 25 depends from claim 24 and, as such, incorporates all of the features recited in claim 24. Applicants respectfully submit that Mishurnyi *et al.*, Boos *et al.* and Garbuzov *et al.*,

alone or in any reasonable combination, do not teach or suggest “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in claim 25.

As discussed above, Mishurnyi *et al.* and Boos *et al.* do not teach or suggest the above feature.

Garbuzov *et al.* is cited by the Examiner to provide teachings for the feature added in claim 25. Garbuzov *et al.*, however, does not teach or suggest “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in claim 25. Although Garbuzov *et al.* is combined with Mishurnyi *et al.* and Boos *et al.*, the combination does not teach or suggest the above feature. There is no disclosure in the cited references of an etchant for etching a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material.

For the reasons set forth above, Applicants respectfully submit that Mishurnyi *et al.*, Boos *et al.* and Garbuzov *et al.*, alone or in any reasonable combination, do not teach or suggest all of the limitations of claim 25. Therefore, Applicants respectfully request that the Examiner reconsider and withdraw the above rejection of claim 25.

**V. Rejection of Claims 26-31 under 35 U.S.C. §103(a)**

Claims 26-31 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Mishurnyi *et al.* or Mishurnyi *et al.* in view of Boos *et al.*, and further in view of Deryagin *et al.* (“High Quality AlGaSb, AlGaAsAb and InGaAsSb epitaxial layers grown by liquid-phase epitaxy from Sb-rich melts”). See Office Action, page 5. Applicants respectfully traverse this rejection in view of the amended claims.

Claim 26-31 depend from amended claim 24 and, as such, incorporate all of the features recited in amended claim 24. Applicants respectfully submit that Mishurnyi *et al.*, Boos *et al.*

and Deryagin *et al.*, alone or in any reasonable combination, do not teach or suggest “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in claims 26-31.

As discussed above, Mishurnyi *et al.* and Boos *et al.* do not teach or suggest the above feature.

Deryagin *et al.* is cited by the Examiner to provide teachings for the feature added in claims 26-31. Deryagin *et al.*, however, does not teach or suggest “a wet acid etchant for wet acid etching of a portion of the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material, the wet acid etchant comprising: a) organic acid; b) oxidizing agent; and c) hydrofluoric acid,” as recited in claim 25. Although Deryagin *et al.* is combined with Mishurnyi *et al.* and Boos *et al.*, the combination does not teach or suggest the above feature. The cited references are silent about an etchant for etching the  $\text{Al}_{1-x-z}\text{Ga}_x\text{In}_z\text{As}_{1-y}\text{Sb}_y$  material.

For the reasons set forth above, Applicants respectfully submit that Mishurnyi *et al.*, Boos *et al.* and Deryagin *et al.*, alone or in any reasonable combination, do not teach or suggest all of the limitations of claims 26-31. Therefore, Applicants respectfully request that the Examiner reconsider and withdraw the rejection of claims 26-31 under 35 U.S.C. § 103(a).

## **VI. Conclusion**

In view of the above comments, Applicants believe that the pending application is in condition for allowance and urges the Examiner to pass the claims to allowance. Should the Examiner feel that a teleconference would expedite the prosecution of this application, the Examiner is urged to contact the Applicant's attorney at (617) 227-7400.

Please charge any shortage or credit any overpayment of fees to our Deposit Account No. 12-0080, under Order No. BRW-002USRCE. In the event that a petition for an extension of

time is required to be submitted herewith, and the requisite petition does not accompany this response, the undersigned hereby petitions under 37 C.F.R. §1.136(a) for an extension of time for as many months as are required to render this submission timely. Any fee due is authorized to be charged to the aforementioned Deposit Account.

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